

WHO'S LOOKING AFTER SCOTTISH SCIENCE?

Prospect is a trade union which represents 102,000 scientific, technical, managerial and specialist staff in the civil service and related bodies and major companies UK wide. Over 4,000 of our members are employed in government departments and non-departmental bodies within Scotland.

The Scottish public science base lies chiefly in environmental and rural affairs and consists of the Scottish Agricultural College, Scottish Agricultural and Biological Research Institutes, UK research council-funded institutes, academic institutions and agencies of the Scottish Executive.

CLOSED OR UNDER REVIEW

In March 2006, the Hannah Research Institute was closed – representing a loss of around 1,000 years of scientific experience. It was closed despite its world-class reputation for research into breast cancer and diseases such as diabetes.

The Natural Environment Research Council's recent announcement that it is to close the Centre for Ecology and Hydrology's Banchory site will inevitably impact adversely on research into climate change and biodiversity (see pages 8-13, 'Who's looking after British science').

Sourhope Research Station, one of three Macaulay Institute farms, is under review. Sourhope is one of 11 UK sites in the Environmental Change Network, which measures long-term changes in dry and wet aerial deposition, water quality, soil characteristics, vegetation and wildlife.

FUNDING

All the SABRIs face flat funding for the next five years, resulting in a cut in real terms. Prospect is concerned about the consequences for job security, scientific career development and the quality of scientific research if the Scottish Executive's Rural Affairs Department confirms its projected level of funding for the next few years.

In its spending plans for 2005-08, the Scottish Executive said it would "increase by 7/11m support for environmental and biological science."⁽¹⁾ Yet the Scottish Parliament's Environment and Rural Development Committee has questioned this:

"Research and Sustainable Action and Agriculture and Biological Science... Taking these two [budget] lines together, and ignoring the exceptional costs related to the relocation of SASA, spending in real terms over the period 2004-05 to 2007-08 appears to decline by about £1m (0.9%). However, the Spending Proposals recorded an "increase by £7/11m (in) support for environmental and biological science" in comparison to previous plans for 2006-07 and 2007-08. The Committee requests further explanation from the Minister on this apparent discrepancy."⁽²⁾

INFRASTRUCTURE

Scottish science needs continued and increased SEERAD investment in buildings and facilities to remain competitive, serve Scotland's research needs adequately and attract increased funding from SEERAD and other sources.

For example, the Scottish Crop Research Institute's buildings are now old, inefficient to run (high energy bills) and will need major renovation or replacement over the next five to 10 years. Costs are estimated to be well over £40 million, which SCRI can't afford from its own funds.

COMMISSIONING

Changes in how SEERAD will commission its research in the future has created more uncertainty. There has been a change from grant-in-aid funding to grants for rolling programmes, with one of the biggest uncertainties being how the research institutes' infrastructures will be funded in the future. How will SEERAD decide on the most applicable funding model for the SABRIS? How this transition will be managed, and the scope for more competition for scarce resources, is the subject of a report from the consultancy firm Arthur D Little.⁽³⁾

BIOSCIENCE RESEARCH CENTRE

Although the decision to create a new Bioscience Research Centre in Edinburgh has been taken, it could actually threaten job losses at the Moredun and Roslin Research Institutes and the Institute for Animal Health's Neuropathogenesis Unit. The existing core funding for Roslin and the Neuropathogenesis Unit (around £5.7m) will transfer to the new centre.

Many Scottish scientists, and their colleagues in England and Wales, have been subjected to so many reviews that they feel jaded. Constant reorganisation is a distraction from real science work.

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Science and technology play a key role in underpinning economic success, but without proper investment in the science, the staff and the facilities, this will reduce. This investment cannot be done on the basis of business cases that have no regard to the impact on national scientific capability.

It appears that nobody wants to take on the key responsibility of caring for the national science base. As highlighted in a recent consultancy report looking at the SABRIs, there is a need for "effective and co-ordinated stewardship of the science base" to deliver not only policy requirements and high scientific quality but also provide the value for money so sought after by governments.

Prospect believes it cannot be in Scotland's interests to cut back so much work of practical application, renowned worldwide and peer-reviewed for quality. The short-sightedness of such an approach – and the need for scientific expertise that can respond quickly and flexibly – is unfortunately highlighted by the recent incidence of Avian Influenza.

References:

1) Building a Better Scotland, Spending Proposals 2005-2008:

www.scotland.gov.uk/Publications/2004/09/19984/43699

2) Para 38, Report to the Finance Committee on Stage 2 of the 2005-06 Budget Process, (Session 2) 2004.

3) Procuring Research For SEERAD - Future Commissioning Arrangements: www.scotland.gov.uk/Topics/Research/15597/23177

LAND

SCOTTISH AGRICULTURAL COLLEGE, ABERDEEN, Ayr, EDINBURGH

The Scottish Agricultural College fulfils three major functions to support land-based industries in Scotland. It is the major agricultural educational facility for under and post-graduate students, provides a consultancy service to the Scottish farming industry, and conducts research on a range of agricultural issues.

SAC aims to improve the livelihood of the land-based industries, support the advancement of new technologies and give good business advice in times of complex legislative demands. Projects range from tracking the spread of mosquitoes across Scotland to the best use of grasses and forage.

SAC has eight veterinary disease surveillance centres that monitor disease in agricultural animals throughout Scotland, conducting post mortems to inform SEERAD's database of current threats, including work to monitor any avian flu outbreak.

Its recently opened serology department in Dumfries will play a key role in defending the nation against any future outbreak of foot and mouth disease.

Over the last two decades funding from central government has been reduced from 100 per cent to 40 per cent of business turnover. SAC management is currently developing plans to secure the future of its research, consultancy and education facilities. But they will need adequate financial support from central government.

To lose the services that SAC provides would have far-reaching, negative implications for Scotland's land-based industries, rural communities and the staff who deliver this work.



SCOTTISH CROP RESEARCH INSTITUTE, DUNDEE

Soft fruit production in Scotland represents a small, but valuable, sector within the agricultural/horticultural landscape.

The fruit breeding and research group at the Scottish Crop



Research Institute in Dundee occupies a leading position worldwide – members include breeders, geneticists (molecular and classical), pathologists, entomologists, natural product chemists and physiologists.

Their work uses advanced genomics and genetics technologies to improve raspberry, blackberry and blackcurrant breeding stock (germplasm) by developing soft fruits with increased nutritional value, higher levels of durable resistance to damaging pests and diseases, and therefore reduced pesticide use.

Through its commercial arm, Mylnefield Research Services, the Institute has bred successful new breeds of raspberry and blackcurrant for many years. These programmes are sponsored by commercial end-users and, in the case of the raspberry, the Scottish Executive.

Rex Brennan is a plant breeder/geneticist and group coordinator for a newly commissioned SEERAD work package on soft fruit genetics and pathology.

He also conducts a research programme on fruit genetics particularly focused on blackcurrants. The work includes field-based experiments, developing the first blackcurrant genetic linkage map and mapping key traits such as resistance to gall mite, a serious pest in commercial blackcurrant production. New, resistant cultivars amenable to more environmentally-friendly pest management strategies, have been developed.

The nutritional benefits of soft fruit are increasingly important to public health. The SCRI fruit group is working with medical researchers and nutritionists to identify the main fruit quality components, so that breeding stock with enhanced nutritional

value can be identified and selected. The genetic control of key components such as vitamin C is of great interest to the group; this work is currently funded through Defra's Horticulture LINK programme.

Rex and his group maintain a large array of plant material at the SCRI site, so that important characteristics and traits can be dissected effectively. The range of germplasm able to adapt to differing environmental conditions will help the fruit industry of the future face new challenges such as climate change. Warmer winters can cause developmental problems for some fruit species in the following year.

The SCRI group's strength is its interdisciplinary nature. It has developed excellent strategic alliances with other fruit research groups worldwide, including local universities and other research institutes. It is also uniquely able to address scientific issues and challenges from the molecular level through to the whole-plant field scale enterprise.

Woody plant research and breeding is by nature a long-term process. It is essential that the various facets of the group are maintained so that it can continue to improve the sustainability and competitiveness of the UK fruit industry and develop key areas of science that may have broader implications.

SCOTTISH AGRICULTURAL SCIENCE AGENCY, EDINBURGH



Adrian Fox works for the Scottish Agricultural Science Agency, near Edinburgh, where 150 scientists and support staff help ensure the quality and safety of Scotland's food supply.

SASA is a Scottish Executive agency, whose work involves crop certification, disease diagnosis, chemical analysis, surveys and training.

Adrian is virology lab manager within the potato and plant health division, which provides technical support to the Scottish Seed Potato Classification Scheme.

"The crux of our work is during the summer months, when the potato crops grow," he says. "If field inspectors see a suspicious virus symptom in a plant they take a sample and submit it to us for testing." Adrian's team then advises the field inspectors on their next course of action.

"Field inspectors can downgrade a crop on the basis of what they see but sometimes it can be difficult to tell if a crop has a physiological problem caused, for example, by poor nutrients, or if it has an actual disease, which can be far more serious."

The scientists routinely test for ten different viruses. The viruses can reduce crop yields and quality by 10-15 per cent

and can be spread to other farms by aphids. Some viruses can be spread by nematodes and others by fungi.

"One disease we deal with is potato mop top virus. It causes an internal necrotic symptom, dead tissue inside the potato. If you are a crisp or chip manufacturer it is not desirable to have potatoes full of dark chunks."

Other work outside the summer season includes checking potato consignments for export outside the European Union, and further research work.

Before taking on the role five years ago, Adrian worked on identifying potato cyst nematodes and aphids. He qualified with a degree in applied biology specialising in plant sciences.

As a directly funded government organisation, SASA is not currently under threat. But Adrian says cuts to institutions such as the Scottish Agricultural College and Scottish Crop Research Institute could have a knock-on effect.

"We know a lot about our subject but the research by colleagues in these organisations can be an important, specialised resource."

Adrian warns that losing scientific staff can have a serious effect. "People doing this kind of work can take 10-20 years to build up their experience. If they decide to move on, it is a body blow. You can't replace that level of experience in a day.

"It's a good thing we have a professional organisation, a union, willing to stand up against any erosion of funding."

LAND/WATER

MACAULAY INSTITUTE, ABERDEEN

Dr Simon Langan is a principal research scientist at the Macaulay Institute, Aberdeen. Macaulay is a leading centre for land use research. Simon joined in May 1991 to further research on how soils and waters are acidified and how understanding this process can translate into objective policy to reduce atmospheric pollution and the impact on acid-sensitive elements of our environment.



“This was done by using scientific expert knowledge linked to the national soils database,” says Simon. National and international policy makers used this knowledge to underpin the Large Combustion Plant Directive and other European-based protocols requiring reductions in many of the emissions producing the environmentally damaging precursors of acid deposition.

The national soils database is a unique and huge resource that provides a record of the chemical and physical variability of soils across Scotland. It has been built up through the dedicated input of environmental scientists over the last 40 plus years.

More recently, Simon has been working with water, specifically rivers. “We need to understand the variety of pressures

that impact on the volume and quality of our river water to ensure that it will support society’s needs – be it for drinking, recreation or supporting wildlife,” he says.

In the past, factories discharging waste water directly into rivers – point source pollution – was a major issue. Today’s pressures are from a wider range of sources and pollutants. These are commonly associated with land management practices and contribute to non-point or diffuse pollution. There is a need to understand how these are interconnected.

Simon has worked with a range of land managers to test how different management practices can reduce diffuse pollutants and help protect the environment. Such an understanding is vital when advising land managers on best practice. The research also contributes to implementing policies like the Water Framework Directive.

In contrast to universities, research institutes like Macaulay bring together multiple expertise to contribute to national resources like the soils database. They can also generate and act as custodians of long-term data sets, such as the Environmental Change Network, (the UK’s long-term, integrated environmental monitoring and research programme which gathers information about the pressures on and responses to environmental change in physical, chemical and biological systems.)

Science needs adequate resources to undertake this type of research and work: collecting robust data from field measurements, analysing and modelling the data, and discussing the results with land managers and other interested parties.

“By integrating these approaches, we will be in a position to provide objective and sound data on which evidence-based policies can be built,” says Simon.

“The soils database was built up through the dedicated input of environmental scientists over more than 40 years”

ANIMALS

MOREDUN RESEARCH INSTITUTE, PENICUIK

The Moredun Research Institute was originally set up by farmers for farmers, to address the problems they faced every day.

Its remit has remained constant throughout its 86-year history – to improve animal health and welfare by reducing the burden of disease.

Improving the health and welfare of farmed animals involves developing diagnostic tests, as well as vaccines and successful control strategies for diseases such as parasitic gastro-enteritis, foot rot and watery-mouth.

Researchers regularly provide information to farmers through trade journals, news sheets and animal health road shows across the UK.

Instruments like a user-friendly thermometer for detecting hypothermic lambs and a 'warming-box' to treat them have been developed through close collaboration between expert scientists and the farming industry.

These close ties mean that Moredun can gauge UK farmers' opinions on livestock health, and researchers can react to emerging problems.

The institute's research aims to combat diseases such as transmissible encephalopathies (BSE being the best known), and contributes to initiatives like the Sustainable Control of Parasites in Sheep (SCOPS). It also provides expert opinion to many groups, such as those working to protect Scotland's biodiversity.

Moredun takes a multidisciplinary approach to investigating particular disease problems, including enzootic abortion in ewes and orf, a contagious, pustular dermatitis that affects sheep and goats and can be transmitted to humans.

Farmers throughout the UK regularly cite orf as one of the major problems affecting the health and welfare of their animals, particularly around lambing time. Many thousands of doses of an orf vaccine, which was tested at Moredun, are sold each year.

One spin-off from the orf research at Moredun is that researchers, led by Dr Colin McInnes, are now investigating a disease which is a major contributing factor in the decline of red squirrels in the UK.

It is caused by a very similar virus to the one that causes orf in sheep. The virus is carried asymptotically by grey squirrels and passed on to the red squirrels, which rapidly succumb to disease and die.

Moredun scientists are currently monitoring the spread of the virus through the north of England and the Scottish borders, and know much more about it now than three years ago.

Colin is concerned that the current changes in funding structure could jeopardise the ability to address the problems of endemic and emerging diseases.

"It is not clear how the research institute's infrastructure will be funded in the future," he says. "Although the move to funding on the basis of full economic costs could eventually be beneficial, the current proposal to pay only 80 per cent of the full economic costs will put the institutes at a competitive disadvantage compared to those organisations which have a dual funding structure*."

* Under the 'dual support' funding system, Scottish higher education institutes receive core funding from the Scottish Funding Council and funding for specific projects from the UK Government's Office of Science and Innovation.

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ROSLIN INSTITUTE, EDINBURGH

The Roslin Institute has a national and international role focused on delivering the benefits of the genetic revolution to society through world class research in animal biology.

The research programme is evolving rapidly and focuses on core strengths in genetics, genomics and bioinformatics in farm animals, with programmes on genetic modification, genetics of disease resistance, and developmental biology.

Roslin operates ARK-Genomics: the Centre for Comparative and Functional Genomics in Farm Animals for the UK academic community and manages the service which hosts genome databases for several species (ARKdb).

Over the last year the Institute has withdrawn from welfare biology and behaviour, and avian endocrinology (the study of the glands and hormones of the body and their related disorders).

Roslin and the other Biotechnology and Biological Sciences Research Council institutes face testing times, with the period to 2010 being one of opportunity – but also continuing challenge.

ANIMALS/HUMANS

Realignment of research priorities in recent years has reduced exposure to the vagaries of DEFRA research policy. While DEFRA remains a significant source of funding, not so long ago it was the largest single source of research funding for the Institute.

Securing funding remains a major preoccupation: in 2004/05 income fell to £12.6m and staff numbers to 250 – from over 300 in year 2000. Twenty-five per cent of income is in the form of a strategic grant from BBSRC. The remainder is raised through competitive funding from BBSRC and other research councils, the European Union, UK government departments, the Scottish Executive and industry.

After 20 years of merger and reorganisation, Roslin has again been asked to recreate itself for a role as the BBSRC partner in a joint centre with the University of Edinburgh. This will involve merging with the Institute for Animal Health's Edinburgh laboratory.

Roslin also has a review of Institute governance within BBSRC, and, like everyone in the research councils, is awaiting the local impact of the research councils' shared services project.

THE HANNAH RESEARCH INSTITUTE, AYR 1928 – 2006

Hannah Research Institute, Ayr closed on March 31, 2006 – representing a loss of around 1,000 years of scientific experience related to lactation, breast cancer, obesity, diabetes, food quality and safety.



Dr Iain Gow was a principal scientist, employed there from 1997 until 2006. He also had other roles, including Home Office liaison officer, and head of biological resources. He was also an active Prospect representative.

He believes that in the current scientific climate, it is difficult to see how such a wealth of strategically important, policy-

relevant research could be resurrected and given the long-term support politicians tell us it deserves.

“Hannah was also extremely good value for money when compared with equivalent university departments,” he says, “Hannah costs were around 30 per cent of the research costs in a university for equivalent work, at an equivalent standard.”

Although Iain and colleagues moved on to other posts, albeit on three-year fixed-term contracts, many former staff are unemployed.

Iain and a colleague were the principal investigators on a SEERAD core-funded project which studied changes in ion transport in human breast cancer cell lines.

The project was looking at the way ions such as potassium or chloride move in and out of breast cancer cells. Control of this process has been linked to the ability of those cells to undergo normal, “programmed” cell death (apoptosis).

Iain said that a lack of, or reduced rate of apoptosis, had been linked to cells becoming tumourigenic. Regulating these processes may be important in determining whether or not a cell becomes cancerous, and may ultimately have identified potential therapeutic targets.

Some cell types have specific types of potassium channels which, if activated, will protect that cell from apoptosis. Blocking such channels with drugs in the laboratory allows the cells to die.

The family of chloride transporters Iain and his team had hoped to study were even more interesting: they are present in normal breast cells, but not cancerous ones. Experimentally increasing the number of these transporters in normal cells increases the rate of cell death, and artificially introducing them into cancerous cells reduces their ability to grow.

Such cellular mechanisms, which are potentially relevant to cell growth and death, are important to tumour initiation and progression.

“We were very disappointed that such work was not considered suitable for direct Executive support under its research institute scheme,” says Iain, (pictured below).



HUMANS



ROWETT RESEARCH INSTITUTE, ABERDEEN

Obesity is growing in prevalence within the UK, with over half of the adult population collectively overweight and obese. Similarly, one in four children are overweight. Carrying excess body fat is a risk factor for mortality and morbidity and thus the economic consequences of obesity account for a significant proportion (6-8 per cent) of healthcare budgets. Obesity is not an easy problem to tackle, despite the knowledge that a small weight loss confers medical benefits. Part of the solution is to prevent obesity, as well as intervention for those that have already become obese.

Dr Alex Johnstone, a post-doctoral research scientist, has been at the Rowett for more than ten years. The Institute is funded by the Scottish Executive Environment and Rural Affairs Department and is the only human diet and health institute funded in Scotland.

Alex's main areas of scientific interest are the prevention and treatment of obesity and examining how specific dietary strategies impact on indices of metabolism, body composition and health. The aim is provide evidence-based research which investigates dietary and behavioural approaches to weight management, which can be utilised by relevant end-users such as health professionals and public health decision makers.

Obesity has a negative impact at an individual level, and the consequences of obesity are hard to reverse. The research team approach at the Rowett allows investigation of the impact of dietary manipulations on weight loss and improvement on metabolic health.

The research work is with human volunteers, who are provided with their dietary intake for up to three months at a time, based within the residential or out-patient facilities at the Human Nutrition Unit which has specialised facilities for this type of controlled experiment.

The subjects undergo many sophisticated physiological, metabolic and psychometric tests to investigate some of the mechanisms involved in obesity and weight loss. Alex also collaborates with colleagues who are investigating and characterising the molecular components of energy balance regulatory systems in tissues, cells and animal models.

This approach of molecule to man – combined with specialised facilities and expertise – gives the institute a unique insight.

The solution to obesity is apparently simple – 'eat less and exercise more'. However, although most people are aware of these principles, actually avoiding weight gain in modern society is difficult.

Current research is focusing on developing strategies that produce sustainable weight loss through dietary interventions that individuals can adhere to – compliance is the key issue.

Recent attention has focused on the role of diet composition in weight control and metabolic health outcomes.

High-protein diets such as the Atkins diet have been publicised as a potential tool to aid weight loss, because of the observation that energy intake is less and people feel fuller on these types of diets. However, despite anecdotal reports of success, there is a lack of scientifically proven explanations, and some nutritionists have concerns about high intakes of saturated fats.

The researchers are looking at optimising the level and composition of dietary macronutrients to help weight control and improve metabolic health, by specific manipulation of protein content and quantity or quality of carbohydrates (for example, the glycaemic index or amount and type of carbohydrate in the diet).

The Rowett researchers aim to develop effective, but healthy, strategies to prevent the current obesity epidemic.



UK ASTRONOMY TECHNOLOGY CENTRE, EDINBURGH

The UK Astronomy Technology Centre is a scientific establishment belonging to the Particle Physics and Astronomy Research Council.

The centre helps keep the UK at the forefront of world astronomy by providing a UK focus for designing, producing and promoting state-of-the-art astronomical technology.

The UK ATC is also involved in technology transfer and has strong industry links with businesses in Scotland.

There are currently around 120 staff at the UK ATC, including scientists, managers, engineers and other specialists and administration staff. It is located at the Royal Observatory on Blackford Hill in Edinburgh with the University of Edinburgh's Institute for Astronomy and the Royal Observatory Visitor Centre which promotes science teaching.

The Royal Observatory has been a prominent landmark on the Edinburgh skyline since it was established in 1894. Astronomy was one of the first subjects taught at the University of Edinburgh.

Restructuring of science funding, already at an uncompetitively low level, has led to serious problems providing project work within PPARC and, in particular, at the UK ATC.

There is no more money in PPARC for new projects until the next Spending Review in 2007. This means that the affordable programme is already known, and it is not good news for the UK ATC.

Known or likely work between now and the 2009/10 financial year has been cut by more than half. The impact of

this is already being felt – 26 staff have been, or will be, made redundant over the next 12 months.

Project managers, optical, mechanical, electronics and software engineers are being lost to UK astronomy as the core skill set is reduced to match the known funding.

The centre's future is also likely to be affected by the outcome of a consultation announced in the March 2006 budget ("Science and innovation investment framework 2004-2014: next steps").

This consultation wants to establish whether PPARC and the Council for the Central Laboratory for the Research Councils should merge to form a single, large facilities research council. While this is a welcome development scientifically, it raises questions about the future viability of the UK ATC.

Working with the much larger science and innovation campuses currently operated by CCLRC at Harwell in Oxfordshire and at Daresbury in Cheshire will inevitably lead to examination of the rationale of the Department of Trade and Industry/Office of Science and Innovation maintaining the much smaller partner in Edinburgh. OSI is responsible for UK science policy and for funding basic research allocated via the research councils.

There is already an internal PPARC consultation on the future of its UK and international establishments, including the UK ATC. Senior managers at the ATC have begun exploring alternative management models for the future, including discussions with the Scottish Universities Physics Alliance, although this may well be affected by the research council merger consultation described above.

Furthermore, Research Councils UK, in which PPARC is a partner, has begun consultation on establishing a single shared services centre for all eight research councils, covering HR, finance, procurement, IT support and estate management.

Administration staff at the UK ATC have already been warned that posts are likely to be relocated, probably to Swindon, further reducing the complement in Edinburgh.

If the cuts in the UK ATC reduce the UK's ability to provide instrumentation to its partner telescopes, or to participate in future new missions, the impact of UK science will be seriously diminished, as will the potential for beneficial economic impact, both locally and across the UK.

The UK ATC has made a significant contribution to the recently released statistic which shows that Scotland delivers one of the highest numbers of research papers per capita in the world. This is a record which staff at the UK ATC would like Scotland to sustain.